In the Claims:

Claim 1 (currently amended): A method of fabricating a semiconductor device, having a reduced-oxygen copper-zinc alloy (Cu-Zn) thin film formed on a copper (Cu) surface by electroplating the Cu surface in a chemical solution, comprising the steps of:

~~providing~~forming ~~a semiconductor substrate having~~ a Cu surface on a semiconductor substrate;

providing a chemical solution;

electroplating the Cu surface in the chemical solution, thereby forming a Cu-Zn alloy thin film on the Cu surface, wherein the Cu-Zn alloy thin film completely covers the Cu surface;

rinsing the Cu-Zn alloy thin film in a solvent:

drying the Cu-Zn alloy thin film under a gaseous flow:

annealing the Cu-Zn alloy thin film formed on the Cu surface, thereby forming a reduced-oxygen Cu-Zn alloy thin film; and

completing formation of the semiconductor device.

Claim 2 (original): A method, as recited in Claim 1,

wherein the chemical solution is nontoxic and aqueous, and

wherein the chemical solution comprises:

at least one zinc (Zn) ion source for providing a plurality of Zn ions;

at least one copper (Cu) ion source for providing a plurality of Cu ions;

at least one complexing agent for complexing the plurality of Cu ions;

at least one pH adjuster;

at least one wetting agent for stabilizing the chemical solution, all being dissolved in a volume of deionized (DI) water.

Claim 3 (currently amended): A method, as recited in Claim 2,

wherein the at least one zinc (Zn) ion source comprises at least one zinc salt selected from a group consisting ~~essentially~~ of zinc acetate ($(CH_3C0_2)_2Zn$), zinc bromide ($ZnBr_2$), zinc carbonate hydroxide ($ZnCO_3{\cdot}2Zn(OH)_2$), zinc dichloride ($ZnCl_2$), zinc citrate ($(O_2CCH_2C(OH)(CO_2)CH_2CO_2)_2Zn_3$), zinc iodide ($ZnI_2$), zinc L-lactate ($(CH_3CH(OH)CO_2)_2Zn$), zinc nitrate ($Zn(NO_3)_2$), zinc stearate ($(CH_3(CH_2)_{16}CO_2)_2Zn$), zinc sulfate ($ZnSO_4$), zinc sulfide (ZnS), zinc sulfite ($ZnSO_3$), and their hydrates.

Claim 4 (currently amended): A method, as recited in Claim 2,

wherein the at least one copper (Cu) ion source comprises at least one copper salt selected from a group consisting ~~essentially~~ of copper(I) acetate (CH_3CO_2Cu), copper(II) acetate ($(CH_3CO_2)_2Cu$), copper(I) bromide (CuBr), copper (II) bromide ($CuBr_2$), copper (II) hydroxide ($Cu(OH)_2$), copper (II) hydroxide phosphate ($Cu_2(OH)PO_4$), copper(I) iodide (CuI), copper (II) nitrate ($(CuNO_3)_2$), copper(II) sulfate ($CuSO_4$), copper(I) sulfide (Cu_2S), copper(II) sulfide (CuS), copper (II) tartrate ($(CH(OH)CO_2)_2Cu$), and their

hydrates.

Claim 5 (original): A method, as recited in Claim 1,

wherein said electroplating step comprises using an electroplating apparatus, and wherein said electroplating apparatus comprises:

(a) a cathode-wafer;

(b) an anode;

(c) an electroplating vessel; and

(d) a voltage source.

Claim 6 (currently amended): A method, as recited in Claim 5,

wherein the cathode-wafer comprises the Cu surface, and

wherein the anode comprises at least one material selected from a group consisting ~~essentially~~ of copper (Cu), a copper-platinum alloy (Cu-Pt), titanium (Ti), platinum (Pt), a titanium-platinum alloy (Ti-Pt), an anodized copper-zinc alloy (Cu-Zn, i.e., brass), a platinized titanium (Pt/Ti), and a platinized copper-zinc (Pt/Cu-Zn, i.e., platinized brass).

Claim 7 (canceled).

Claim 8 (currently amended): A method, as recited in Claim 5,

wherein said electroplating comprises a plating condition selected from a group

consisting ~~essentially~~ of a direct voltage in the range of approximately 1 V to approximately 4 V and a direct current in the range of approximately 0.01 A to approximately 0.2 A.

Claim 9 (currently amended): A method, as recited in Claim 5,

wherein the Zn-doping in the reduced-oxygen Cu-Zn alloy thin film is controllable by varying at least one electroplating condition selected from a group consisting ~~essentially~~ of:

increasing the at least one zinc (Zn) ion source concentration, thereby slowly increasing said Zn-doping;

increasing the at least one copper (Cu) ion source concentration, thereby slowly decreasing said Zn-doping;

increasing the solution flow rate increases Zn-doping, thereby increasing the pH decreases cathodic efficiency with respect to Zn, and thereby decreasing said Zn-doping;

increasing the electroplating duration, thereby slowly decreasing said Zn-doping;

using a Cu anode, thereby decreasing said Zn-doping;

using a brass anode, thereby increasing said Zn-doping;

increasing the voltage, thereby increasing the Zn-doping; and

increasing the current, thereby increasing the Zn-doping.

Claim 10 (original): A method, as recited in Claim 1,

wherein the annealing step is performed in a temperature range of approximately 150°C to approximately 450°C, and

wherein the annealing step is performed for a duration range of approximately 0.5 minutes to approximately 60 minutes.

Claim 11 (currently amended): A semiconductor device, having a reduced-oxygen copper-zinc alloy (Cu-Zn) thin film formed on a copper (Cu) surface by electroplating the Cu surface in a chemical solution, fabricated by a method comprising the steps of:

~~providing~~forming ~~a semiconductor substrate having~~ a Cu surface on a semiconductor substrate;

providing a chemical solution;

electroplating the Cu surface in the chemical solution, thereby forming a Cu-Zn alloy thin film on the Cu surface, wherein the Cu-Zn alloy thin film completely covers the Cu surface;

rinsing the Cu-Zn alloy thin film in a solvent;

drying the Cu-Zn alloy thin film under a gaseous flow;

annealing the Cu-Zn alloy thin film formed on the Cu surface, thereby forming a reduced-oxygen Cu-Zn alloy thin film; and

completing formation of the semiconductor device.

Claim 12 (original): A device, as recited in Claim 11,

wherein the chemical solution is nontoxic and aqueous, and

wherein the chemical solution comprises:

at least one zinc (Zn) ion source for providing a plurality of Zn ions;

at least one copper (Cu) ion source for providing a plurality of Cu ions;

at least one complexing agent for complexing the plurality of Cu ions;

at least one pH adjuster;

at least one wetting agent for stabilizing the chemical solution, all being dissolved in a volume of deionized (DI) water.

Claim 13 (currently amended): A device, as recited in Claim 12,

wherein the at least one zinc (Zn) ion source comprises at least one zinc salt selected from a group consisting ~~essentially~~ of zinc acetate ($(CH_3C0_2)_2Zn$), zinc bromide ($ZnBr_2$), zinc carbonate hydroxide ($ZnCO_3{\cdot}2Zn(OH)_2$), zinc dichloride ($ZnCl_2$), zinc citrate ($(O_2CCH_2C(OH)(CO_2)CH_2CO_2)_2Zn_3$), zinc iodide ($ZnI_2$), zinc L-lactate ($(CH_3CH(OH)CO_2)_2Zn$), zinc nitrate ($Zn(NO_3)_2$), zinc stearate ($(CH_3(CH_2)_{16}CO_2)_2Zn$), zinc sulfate ($ZnSO_4$), zinc sulfide (ZnS), zinc sulfite ($ZnSO_3$), and their hydrates.

Claim 14 (currently amended): A device, as recited in Claim 12,

wherein the at least one copper (Cu) ion source comprises at least one copper salt

selected from a group consisting ~~essentially~~ of copper(I) acetate (CH_3CO_2Cu), copper(II) acetate ($(CH_3CO_2)_2Cu$), copper(I) bromide (CuBr), copper (II) bromide ($CuBr_2$), copper (II) hydroxide ($Cu(OH)_2$), copper (II) hydroxide phosphate ($Cu_2(OH)PO_4$), copper(I) iodide (CuI), copper (II) nitrate ($(CuNO_3)_2$), copper(II) sulfate ($CuSO_4$), copper(I) sulfide (Cu_2S), copper(II) sulfide (CuS), copper (II) tartrate ($(CH(OH)CO_2)_2Cu$), and their hydrates.

Claim 15 (original): A device, as recited in Claim 11,

wherein said electroplating step of said method comprises using an electroplating apparatus, and

wherein said electroplating apparatus comprises:

(a) a cathode-wafer;

(b) an anode;

(c) an electroplating vessel; and

(d) a voltage source.

Claim 16 (currently amended): A device, as recited in Claim 15,

wherein the cathode-wafer comprises the Cu surface, and

wherein the anode comprises at least one material selected from a group consisting ~~essentially~~ of copper (Cu), a copper-platinum alloy (Cu-Pt), titanium (Ti), platinum (Pt), a titanium-platinum alloy (Ti-Pt), an anodized copper-zinc alloy (Cu-Zn, i.e., brass), a

platinized titanium (Pt/Ti), and a platinized copper-zinc (Pt/Cu-Zn, i.e., platinized brass).

Claim 17 (canceled).

Claim 18 (currently amended): A device, as recited in Claim 15,

wherein said electroplating comprises a plating condition selected from a group consisting ~~essentially~~ of a direct voltage in the range of approximately 1 V to approximately 4 V and a direct current in the range of approximately 0.01 A to approximately 0.2 A.

Claim 19 (currently amended): A device, as recited in Claim 15,

wherein the Zn-doping (i.e., Zn content) in the reduced-oxygen Cu-Zn alloy thin film is controllable by varying at least one electroplating condition selected from a group consisting ~~essentially~~ of:

increasing the at least one zinc (Zn) ion source concentration, thereby slowly increasing said Zn-doping;

increasing the at least one copper (Cu) ion source concentration, thereby slowly decreasing said Zn-doping;

increasing the solution flow rate increases Zn-doping, thereby increasing the pH decreases cathodic efficiency with respect to Zn, and thereby decreasing said Zn-doping;

increasing the electroplating duration, thereby slowly decreasing said Zn-doping;

using a Cu anode, thereby decreasing said Zn-doping;

using a brass anode, thereby increasing said Zn-doping;

increasing the voltage, thereby increasing the Zn-doping; and

increasing the current, thereby increasing the Zn-doping.

Claim 20 (currently amended): A semiconductor device, having a reduced-oxygen copper-zinc alloy (Cu-Zn) thin film formed on a copper (Cu) surface, comprising:

a semiconductor substrate having at least one Cu surface formed thereon; and

a reduced-oxygen Cu-Zn alloy thin film formed, by electroplating, and disposed on the at least one Cu surface, wherein the reduced-oxygen Cu-Zn alloy thin film completely covers the at least one Cu surface,

wherein the reduced-oxygen Cu-Zn alloy thin film is formed by annealing a Cu-Zn alloy thin film in a temperature range of approximately 150°C to approximately 450°C, and

wherein the reduced-oxygen Cu-Zn alloy thin film is formed by annealing a Cu-Zn alloy thin film for a duration range of approximately 0.5 minutes to approximately 60 minutes.